THE MODEL ENGINEER

Vol. 99 No. 2465 THURSDAY AUGUST 19 1948 9d.

The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

19TH AUGUST 1948 VOL. 99 NO. 2465

SMOKE RINGS

Our Cover Picture

● IN ORDER to draw the attention of readers to the opening of the "M.E." Exhibition, I have this week prepared a cover which is a composite picture showing some of the interesting models entered in the competition section.

By the time this issue reaches you, the exhibition will have opened and visitors from this country and many hundreds from overseas will be enjoying the feast.—P.D.

How To Get There

● FOR READERS who have not previously visited the exhibition, the following notes will, I hope, prove helpful and possibly save time. If you are coming from Victoria Station the best way is to walk down Victoria Street in the direction of Westminster, turn off to the right at Ashley Gardens and continue down Ashley Gardens until you come to the Old Horticultural Hall on your left. Then turn left and the New Royal Horticultural Hall lies immediately behind the old hall.

For those coming from the Westminster end, proceed down Victoria Street, and turn left down Artillery Row, which runs down one side of the Army and Navy Stores, then take the first left, Great Peter Street, and immediately cross the road half-right and proceed down Greycoat Street which turns off Great Peter Street to the right. Once in Greycoat Street the hall is visible on the left-hand side.

This latter instruction also applies for those coming from St. James's Park, the nearest underground station.—P.D.

Still More Prizes

● SO FAR as information is available, it seems that more prizes are being offered at this year's exhibition than ever before. The latest addition comes from The Myford Engineering Co. of Beeston, Notts. who are giving one of their swivelling vertical slides suitable for most lathes of sizes similar to the Myford range. This award is at the discretion of the judges.

I am also pleased to announce a prize of two guineas given by the Quickset Tool Holder Co. Ltd. to be awarded to a youth aged sixteen to nineteen years, who, in the opinion of the judges, should receive encouragement.

An award of two pounds comes from Mr. G. W. Hole for the best model motor-cycle in the competition section.—P.D.

A Derelict Ploughing Engine

● AMONG THE numerous letters I have lately received on the subject of traction engines was one from Mr. D. J. W. Brough, of Cheam, enclosing two photographs—one of which is reproduced—showing an interesting derelict that is to be seen on the side of a road near Hemel Hempstead, Herts. The engine is unquestionably a Fowler Plough engine, of a type built by John Fowler & Co. in the 1870's, and it is of more than ordinary interest. Mr. P. E. Brown, of the Road Locomotive Society, points out that the photograph clearly shows that the engine has never been rebuilt, though it is obviously partially dismantled. But that is not all; the cylinder and valve-chest arrangement is the reverse of the usual, in that the valve-chest is on the right-hand side, whilst the valve-rod has a supporting bearing carried on a bracket bolted to the boiler barrel. Fowler's usual arrangement was to fit the rocking-shaft for the link-motion direct on the cylinder foot casting, and the link operated direct on the valve-spindle as it left its stuffing-box. The dome-shaped safety-valve casing is noteworthy, and the engine has a plate on the smokebox door with the name "Papworth" on it. Perhaps, some reader may have known this engine in its earlier days.—J.N.M.

A New Track

● MR. J. W. GURTON, hon. secretary of the Thurrock Models Society, has written to say that the society has obtained permission from the local council to construct a permanent multi-gauge track round the new boating-pool on the river-front near Grays, Essex. The facilities include a building, 50 ft. by 15 ft., and space for about 200 yards of track. Work is to begin as soon as the final details have been settled. This is certainly very good news of a kind which I would like to hear from other localities. Some local councils are slow in realising that model engineering activities of all kinds are a definite asset to the community; but others are fully alive to the possibilities, fortunately! I am glad to know that Grays has one of the latter. Mr. Gurton hopes that, when running on the track becomes possible, he will hear from any "live steamers" who may be looking for track facilities or would like to do a bit of passenger-hauling. In the meantime, I hope he will keep me informed of progress in the track's construction; and I would also like to know what gauges will be available when the track is finished.—J.N.M.

Douglas M. Picknell

● WITH MUCH regret I have to announce the death, on July 27th, of Mr. Douglas M. Picknell, one of the founders and a past chairman of the Birmingham Society of Model Engineers, as well as an old and respected member of the Bournville Model Yacht and Power Boat Club.

I met him on a number of occasions and I enjoyed his acquaintance; he was one of the really enthusiastic model engineers, and a successful competitor in "M.E." Exhibition competitions in the past. His principal interest was in model power-boats, but his outlook was a wide one and I know that he was always a very competent adviser and a true friend to the members of the Birmingham Society, where he will be greatly missed.—J.N.M.

A New Club for Birmingham

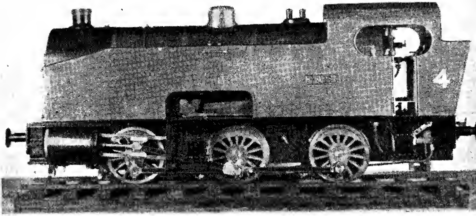
● I HAVE received a letter from Mr. W. A. Clements of 128, Whitecroft Road, Sheldon, Birmingham 26, who is the secretary and treasurer of a newly-formed club in Birmingham known as the Birmingham Modellers Club. This club, I understand, is at present in its infancy, but appears, from a copy of the rules and membership card received, to be organised in a business-like manner. Mr. Clements invites anyone who may be interested to write to him at the above address.—P.D.

A Model Industrial Tank Loco

by S. A. Baker

THE $3\frac{1}{2}$-in. gauge industrial tank engine *Mabel*, which I mentioned in an article describing my $2\frac{1}{2}$-in. gauge L.N.E.R. Pacific, *Princess Christine* is here illustrated complete, and has passed its trials with great success. I am, therefore, submitting a description in the hope that it will interest readers.

steps. The buffer-beams are the full depth of the frames as in the prototype. Three stays are fitted, one in front of and one behind the firebox, and one in a horizontal position between the cylinders, this latter stay forming a platform for the axle-driven pump. This is a departure from the accepted practice in miniature loco-



"*Mabel*"—*Mr. Baker's* $3\frac{1}{2}$*-in. gauge* 0-6-0 *tank engine*

motive construction, and is $\frac{7}{16}$-in. bore by $\frac{7}{16}$-in. stroke, double acting. It is very compact, the body being machined from a solid block of gunmetal with integral valve-boxes at each end connected by drilled passages.

This locomotive is not intended to be a scale model of any particular prototype, but is representative of the heavy type industrial tank engine as used at collieries and steel works. The main dimensions and outline were taken from the 0-6-0T engines owned by the Appleby Frodingham Steel Company ; in fact, the only difference in outline is the shape of the side tanks which, in my engine, have been carried forward to the front of the smokebox in order to increase the water capacity.

Materials and Drawings

This engine, like the Pacific, was built at a time when materials were very scarce, and, according to some unscrupulous people, worth untold gold. When preparing drawings, provision was made to use as much readily-obtained material as possible, the only castings used being wheels and cylinders. These are the type specified for *Iris*, and were supplied by our friend in need, Mr. Dick Simmonds. The $\frac{1}{8}$-in. steel plate and angle for the frames, also steel for side rods, etc., were bought by weight from the local metal merchants, and cost about three shillings.

The frames are very rigid ; the engine on one occasion fell three feet on to turf when being driven by a friend (he has now learned to sit still when driving !) and sustained only bent

The Favoured Pump

The pump is driven by a long eccentric-rod from an eccentric on the main driving axle, delivery is by a top-feed fitting. I am a firm believer in a reliable axle-driven pump which can keep the boiler supplied under all conditions of service. Although I fit injectors to my engines I prefer to pin my faith to the pump, especially when strange drivers are at the regulator. An emergency hand-pump of the submerged type is installed in the near-side tank.

The cylinders are, as mentioned above, to *Iris* specifications, the valve-gear is Stephenson's with launch-type links suspended at the central position. No motion-plate is fitted, the die-blocks being carried on pendulum levers. The eccentric-straps were sawn and filed from slices parted from bronze bar, the rods, and, in fact, all the motion was cut from gauge steel, with the forks brazed on. The cylinders are lubricated by a mechanical pump driven from a valve crosshead.

The crossheads were machined from a piece

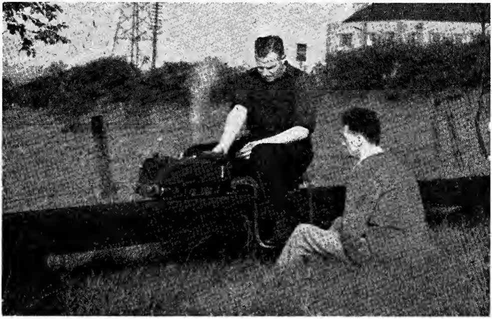
of $\frac{3}{8}$-in. steel plate, the connecting- and coupling-rods were sawn and filed from black mild steel bar. Fluting was done with a home-made Woodruff-type cutter. Incidentally, I make all my own tools of this description, because, apart from the shallowness of my purse, a tool can be made in much less time than it takes to go out and buy one, even if obtainable.

Compensated brakes are fitted (I think a miniature locomotive looks hopelessly wrong without them) with hand and hydraulic operation; they give ample braking power when hauling only one or two passengers, but, of course, with six or eight on board the car brakes are used.

The boiler is all-brazed, and the barrel is made from a piece of my favourite material, to wit, copper hot-water pipe; in this case, a piece 4 in. diameter by 15 in. long was used. The fire-grate is $5\frac{3}{4}$ in. long by $2\frac{5}{8}$ in. wide, the foundation-ring resting on the frame. Fifteen $\frac{3}{8}$-in. tubes (salvaged from a scrapped lorry radiator) and two $\frac{3}{4}$-in. superheater flues are fitted. All plates and firebox wrapper were cut from scrap printers' copper-plate; this firebox has a floral design!

The boiler was tested to 180 lb. per sq. in. water, and steams very freely at 80 lb., on a very lazy fire, despite the fact that the firebox is everything it should not be, i.e., long, narrow and shallow.

The ashpan is fitted above the rear axle and is secured by a pin which, when withdrawn, allows a hinged pan to swing down and the firebars to drop out between the rear axle and middle cross stay, which, being fitted immediately to the rear of the driving axle, protects the motion from grit. All boiler fittings are to "L.B.S.C." specification, and the $\frac{3}{4}$-in. diameter pressure-gauge is home-made and is quite successful; it was made in a few hours, from commonplace materials, and, with the Editor's permission, I will describe it and submit drawings at a later date.



Mr. F. G. Buck keenly interested in "Mabel's" preparation for a run on the track

The nameplates were built up exactly as described by Mr. Jaques in his article on the "Canadian Switcher," in THE MODEL ENGINEER, No. 2359 (great minds, etc.!). The chimney was built up, of brass tube and two rings pressed together; the base was radiused with a fly-cutter, and the chimney was then mounted on a stub mandrel and turned to shape.

The dome-cover was once an anti-aircraft shell nose-cap. As will be gathered, I take a great delight in pressing all sorts of oddments of material into service.

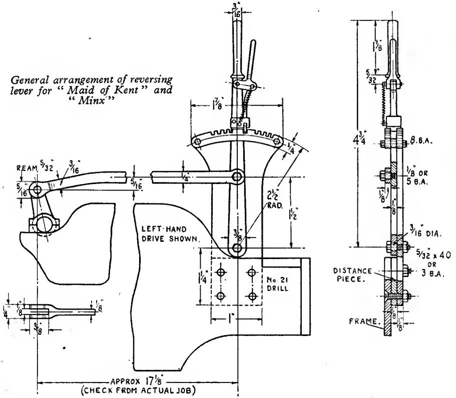
This engine has exceeded all expectations, and just walks away with ten adult passengers, I am sure that it would pull more, but we have no more rolling stock. It has been under steam for $5\frac{1}{2}$ hours at an exhibition, and hauled 520 children. We were able to take only four children at a time, owing to the lightly-constructed track.

The photographs were taken by Mr. F. Buck, and one shows myself driving, with Mr. F. G. Buck an interested spectator.

Reversing Lever for "Maid" and "Minx"

by "L.B.S.C."

THE full-sized "Maids" have a power-operated reverser, consisting of two cylinders, one above the other, like a Westinghouse donkey-pump, the common piston-rod being connected to the reversing-arm of a weighbar shaft located underneath the motion. The driver can admit steam to either end of the steam cylinder by means of a small lever in the cab. The lower cylinder is full of oil, and when the gear is being operated, this oil flows from one side of the piston to the other *via* a connecting passage; when the gear is in the desired position, the connection is closed, and the oil, having no outlet, locks the piston securely. It would be quite possible to make a small edition of this for the 5-in. gauge "Maid of Kent," but, frankly, it isn't worth the trouble. My "Annabel" has a single-cylinder steam reverser, which locks itself automatically in whatever position it is set by the lever in the cab; but it is only what you might call "a bit of old swank"! Anyway, the full-size engines like "Minx" have a plain "pole" reversing-lever; and as this is about the handiest and quickest gadget for engines operating on a short up-and-down road, I am specifying it for both "Maid" and "Minx." The same lever, stand, quadrant and sector plate does for both engines, and it doesn't matter whether you prefer right- or left-hand drive. The only difference will be in the length of the reach-rod connecting the lever to the reverse-arm on the weighbar shaft, or on the end of the slide shaft, if the engine has the Joy valve-gear. The lever-and-stand assembly is mounted on the right- or left-hand frame as desired, on the "Maid of Kent," but it should be placed on the left side in the case of the "Minx," because all her big sisters are what the kiddies call "cackhanded." The parts are made as follow.



General arrangement of reversing lever for "Maid of Kent" and "Minx"

Stand and Lever

The stand is merely a bit of ⅛-in. frame steel; probably you have a bit left over that will be big enough, 3¾ in. long and 1⅞ in. wide. Mark out as shown on the drawing; to get the correct radius of the sector, make a centre-pop 1½ in.

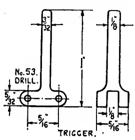
from the bottom, on the vertical centre-line, and strike off the arc with the dividers set to $2\frac{1}{2}$ in. between points. Saw and file to outline. Drill a No. 30 hole at the centre-pop already made, then mark off and drill the four screw-holes with the No. 21 or 5/32-in. drill. They should be about $\frac{3}{16}$ in. from the edge, the upper ones about $\frac{1}{2}$ in. above the lower; the exact position doesn't matter, as long as the screws hold the stand securely to the frame. Next, cut a strip $\frac{1}{4}$ in. wide, to the same radius as the top of the sector-plate; don't bend a bit of $\frac{1}{4}$-in. strip, you'll do better if you cut it from the flat. Clamp it temporarily to the top of the sector, drill a No. 43 hole through each end, and then make two little spacers a shade over $\frac{1}{8}$ in. thick, from $\frac{1}{4}$-in. round mild-steel. Just put a bit in the three-jaw, centre and drill No. 43, and part off two slices. Assemble as shown, with two 8-B.A. bolts through quadrant, spacers, and sector. Don't file any notches yet.

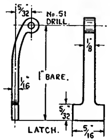
The easiest way to make the lever is to turn up the handle from a bit of $\frac{1}{4}$-in. round steel held in three-jaw, parting off at the collar below the taper part. File up the flat part of the lever from a bit of $\frac{1}{8}$-in. by $\frac{3}{8}$-in. strip steel, tapering it off nicely to the outline shown, then braze it to the handle. Anybody who wants to make a super-posh job can turn and mill the whole doings out of a bit of $\frac{3}{8}$-in. by $\frac{1}{4}$-in. rustless steel; but for an engine intended for hard work and not show, the built-up lever will do all that is required. I made one for "Grosvenor" that way, and it looks realistic enough to please old Inspector Meticulous! Drill a No. 40 hole $1\frac{1}{2}$ in. above the fulcrum-pin hole, and tap it $\frac{1}{8}$ in. or 5-B.A. for the reach-rod pin; the fulcrum-pin hole itself is drilled $\frac{3}{16}$ in.

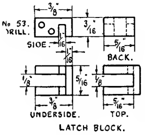
Locking Gear

The trigger, latch, and latch block are what I call footling jobs, but they look very dinky when assembled. The trigger needs a bit of $\frac{1}{4}$-in. by $\frac{5}{16}$-in. steel rod about 1 in. long. Mark the outline of the trigger on the wide side, and drill the two pinholes; then saw away the unwanted metal each side of the actual trigger handle. Trim up with a file, round off the ends of the horizontal part, then mill, or saw and file the $\frac{1}{8}$-in. groove in the latter. The easiest way of doing the milling in the lathe is to use a $\frac{1}{8}$-in. saw-type slotting cutter on a spindle between centres; hold the trigger handle in a machine vice on the saddle, at the right height for the cutter to take out the lot at one movement of the cross-slide, and use slow speed and plenty of cutting oil. Don't feed too quickly, or you'll bend the trigger handle. I do them in one cut on my horizontal miller without disaster.

The latch can be cut out of a bit of $\frac{5}{16}$-in. by $\frac{1}{4}$-in. steel. Mark out the $\frac{5}{16}$-in. side first, and saw away each side, leaving the full-width bit at the bottom, as shown. Then mark out the side, as shown in the side view, and get busy with the saw again, finally trimming up with a file, and drilling the No. 51 hole for the pin. The side view always reminds me of a parrot's head! The stem and the eye can be cut out straight, to save time and labour, and bent to the shape shown, when assembling the parts, so that the hole lines up with the holes in the trigger.







The latch block can be cut from a bit of $\frac{3}{16}$-in. by $\frac{5}{16}$-in. steel; and the easiest way to do it is to clamp a length of this section under the slide-rest tool-holder, and form the $\frac{1}{8}$-in. slot which goes over the lever, in the same way as described for valve-gear forks. If you have a $\frac{1}{16}$-in. saw-type cutter, mount that on a stub mandrel (old bolt does fine) held in three-jaw; set the bit of steel crosswise in the rest, parallel with lathe bed, and adjust the height so that the cutter can form the cross groove to the proper depth at one cut. I used to work these wheezes for all they were worth, in the old days at Norbury before I had a decent milling machine, only I used a vertical slide, plus a small machine-vice, instead of the slide-rest tool-holder, thus getting any height adjustment needed, without need of packing. Then chuck the bit of bar in the four-jaw—it doesn't matter about it running dead true—and part off the slotted piece to length as shown.

The grooves can, of course, be cut in a planing or shaping machine, holding the block in the machine-vice and operating with $\frac{1}{8}$-in. and $\frac{1}{16}$-in ordinary parting tools in the clapper-box, a simple job requiring no elaborate description. They may also be formed by hand, using first a hacksaw, and then a thin file as used by watchmakers, the cross-groove being filed just wide enough to take the latch without shake.

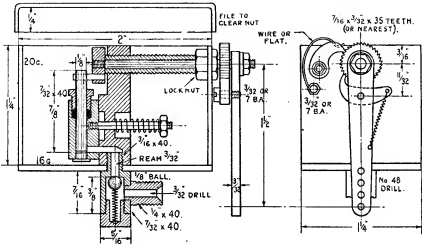
Assembly and Erection

The fulcrum-pin hole in the stand is drilled No. 30 and tapped 5/32-in. by 40 or 3-B.A., and the pin turned up from $\frac{5}{16}$-in. hexagon rod. The plain part should be a good fit in the hole in the bottom of the lever, and just long enough

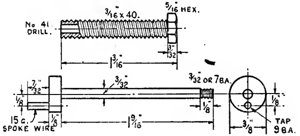
to hold it so that it moves freely without shake, when the nut is tight. Put the lever temporarily in place on the stand, and set the latch-block on it so that it just clears the sector-plate, as shown in the illustration of complete assembly. Clamp temporarily with a toolmaker's cramp, and remove lever; drill two No. 53 holes through the lot, but don't pin it yet, or you won't be able to insert the latch. Next, fit the trigger just under the handle as shown, drilling the hole through lever with No. 51 drill, and pinning with a bit of 16-gauge steel wire. Put the eye of the latch in the slot at the other end of the trigger, and pin that likewise, but let the pin project enough to take the end of a weeny tension spring. Then put the latch-block on, and slide it down until the cross-slot covers the horizontal part of the latch, and the holes in the block line up with those in the lever. Rivet the block in place with a bit of 16-gauge steel wire through each hole, letting one project to take the other end of the tension spring, which is wound up from a bit of 28-gauge steel wire, using a piece of $\frac{1}{16}$-in. silver-steel or 16-gauge spoke-wire for a mandrel.

NOTE: For a left-hand-drive engine, the assembly is exactly as shown. For right-hand drive, simply turn the stand completely around, and put the lever in it with the trigger nearest to you. You can, if desired, change over the tension spring, but it doesn't matter a bean which side of the lever it is on, as long as it holds the latch down.

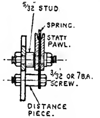
To erect, proceed as follows: Cut out a bit of $\frac{1}{8}$-in. steel plate 1 in. square, to serve as distance-piece. Clamp the stand temporarily to the *outside* of the frame, in the position shown, hard up against the drag-beam angle, and the bottom of the stand 1 in. below top of frame; put the square distance-piece between frame and stand. Run the No. 21 drill clean through the lot, using the holes in bottom of stand as guide. Remove stand and distance-piece; countersink the holes in frame, replace with the stand *inside* the frame (either right or left, according to driver's position desired) with the distance-piece between, and secure with four countersunk screws and nuts. This procedure is exactly the same for both "Maid" and "Minx."



Lubricator for "Maid of Kent" and "Minx"



Bearing shaft and crank

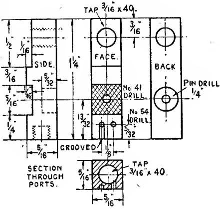


How to erect stationary pawl

Reach-rod

To get the length of the reach-rod, set the lever vertically, and put the valve-gear in what our automobile friends call "neutral," that is,

mid-gear. The reverse-arm on the weighbar shaft of the link motion will be inclined slightly forward, as shown, but the Joy arm will be vertical. The distance between the centres of the eye in the arm, and the tapped hole in the lever, is the length of the reach-rod between centres. This is made from $\frac{1}{8}$-in. by $\frac{5}{16}$-in. steel rod slightly tapered, and set downwards at the front end as shown. The fork is made by brazing on a



Pump stand

little block of steel, and giving it a dose of the same medicine as the forked ends of the eccentric-rods received. The other end is rounded off, drilled $\frac{1}{8}$ in. and attached to the lever by a shouldered pin turned from $\frac{1}{4}$-in. hexagon steel rod, as shown in section, whilst the fork is attached to the reverse-arm by a bit of 5/32-in. silver-steel shouldered down to $\frac{1}{8}$ in. each end, screwed, and furnished with ordinary commercial nuts.

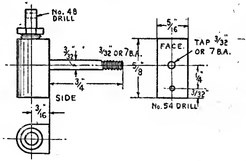
File a notch for the latch, across both sector-plate and quadrant, for the "neutral" position of the lever; then push the lever right forward, and turn the wheels by hand, if the engine has link-motion. The lever will move back a shade, due to the slip of the die; mark where the latch rests when in this position, shift the lever back, and file a notch at the marked spot. Ditto repeato for back gear; then file three more notches at $\frac{1}{16}$ in. intervals as shown in the illustration, and Bob's your uncle. For the Joy-gear engines you don't bother about die slip; merely file the front and back notches (full gear) with the lever up against the spacers at each end of the quadrant, and the intermediate notches as shown.

Mechanical Lubricator

This is the same for both "Maid" and "Minx"; and as it is of the same type which I have described and illustrated for many other engines in these "serials," we needn't go into full details again. I will therefore just give a brief summary of construction. I might remind beginners that I did a lot of experimenting with various types of mechanical lubricators, and settled on this as a "standard" because of its positive action and simplicity of construction. One has been tested on the gauge-testing machine in a full-size locomotive works, and when the little gadget had pumped up to 400 lb. the test was called off for fear of straining the master gauge. That ought to be convincing enough for anybody!

The tank is made from a strip of 20-gauge brass or steel $6\frac{1}{2}$ in. long and $1\frac{1}{4}$ in. wide, bent into a rectangle measuring 2 in. by $1\frac{1}{4}$ in. Stand it on a piece of 16-gauge metal a little bigger than that, braze or silver-solder all around the bottom and the corner joint, and file the bottom flush with the sides. Drill a $\frac{3}{16}$-in. hole in the centre of the bottom plate, and another $\frac{3}{16}$ in. from the top, on the centre-line of one of the short sides. The lid, of the same kind of material, can be flanged up over an iron former. The pump stand and cylinder are made from $\frac{5}{16}$-in. square brass rod. Chuck a length truly in four-jaw, face the end, then centre, drill No. 21 for $\frac{3}{16}$ in. depth and tap $\frac{3}{16}$ in. by 40. Part off at $1\frac{1}{4}$ in. from the end, then mill or file the rebate and recess shown, drill and tap the $\frac{3}{16}$ in. by 40 hole for bearing, drill the trunnion hole and pin-drill it on the plain side, and drill the ports. The right-hand port goes through into the blind hole at the bottom of stand; a groove is cut from the left-hand port to bottom of stand (see section).

Part off a $\frac{5}{8}$-in. length of $\frac{5}{16}$-in. square brass rod, and centre-pop it $\frac{3}{16}$ in. from one side; chuck in four-jaw with this pop running truly, drill through No. 34 and ream $\frac{1}{8}$ in., open out to $\frac{3}{16}$ in. depth with $\frac{3}{16}$-in. drill, tap 7/32 in. by 40, and make a gland to suit, from $\frac{1}{4}$-in. hexagon brass rod. The other end is closed by a little brass plug turned to a drive fit and soldered. Drill the port, drill and tap the hole for trunnion-pin, countersinking same slightly, and true up the rubbing face same as you did the slide valves; same applies to the rubbing face of the stand. The ram is a $\frac{7}{8}$-in. length of $\frac{1}{8}$-in. rustless steel, with a No. 48 cross-hole at the outer end.



Pump cylinder

The gland is packed with a strand of graphited yarn. The trunnion-pin is a piece of 3/32-in. silver-steel, screwed both ends, and the spring is wound from 22-gauge steel wire, and secured by a commercial nut.

For the bearing, chuck a bit of $\frac{5}{16}$-in. hexagon brass rod in three-jaw, face the end, centre, and

drill down $1\frac{1}{4}$ in. with No. 41 drill. Turn down 1 3/32 in. length to $\frac{3}{16}$ in. diameter, screw $\frac{3}{16}$ in. by 40, and part off $1\frac{3}{16}$ in. from the end. The spindle is a piece of 3/32 in. round steel 1 $\frac{11}{16}$ in. overall length, screwed both ends. The crank is a $\frac{1}{8}$-in. slice of $\frac{3}{8}$-in. brass rod, drilled and tapped to suit the spindle, and furnished with a little crankpin made from 15-gauge spoke wire pressed into a No. 49 hole drilled $\frac{1}{8}$ in. from centre.

The check-valve is just an ordinary clack-box turned upside down and provided with a spring to hold the ball to its overhead seating. It is made from $\frac{5}{16}$-in. round rod. Chuck in three-jaw, face, centre, drill down about $\frac{3}{8}$ in. depth with No. 43 drill, open out to $\frac{3}{8}$ in. depth with $\frac{3}{16}$-in. drill and D-bit, and tap 7/32 in. by 40. Part off $\frac{5}{8}$ in. from the end, reverse in chuck, turn down $\frac{3}{16}$ in. of the other end to $\frac{3}{16}$ in. diameter, and screw $\frac{3}{16}$ in. by 40. Poke a 3/32-in. parallel reamer through the middle, seat a $\frac{1}{8}$-in. ball on the hole, and make a cap to fit, from $\frac{5}{16}$-in. hexagon brass rod. Drill a blind $\frac{1}{8}$-in. hole in the middle of this, before parting it off; wind up a little spring from 30-gauge steel wire, and assemble as shown in the sectional illustration. The union nipple in the side of the check-valve is made from $\frac{1}{4}$-in. round brass rod, and silver-soldered in.

The ratchet-wheel should be $\frac{7}{16}$ in. diameter by 3/32 in. thick, with about 35 teeth. My friend who used to supply them, to oblige followers of these notes, doesn't make them any more; one reason being that it was found that they were being purchased by non-users at his "bare-cost" price, and resold at from 300 to 400 per cent. profit! In your humble servant's estimation, turning an act of friendliness into a pocket-lining proposition is one of the meanest forms of "spivery"—I was "caught" that way once, and it taught me a lesson. Dick Simmonds and other advertisers can supply ratchet-wheels, although it isn't a very hard job to cut your own. The wheel is drilled No. 43 and pressed on to the spindle; and mind you set the teeth the right way around, sloping side to your right, vertical or buttress side to your left, or the gadget will work the wrong way, like the famous fish-filleting machine of music-hall fame, which when operated by a left-handed man, shot the bones down his throat and the fish into the garbage can.

The ratchet-lever is filed up from 3/32 in. by $\frac{1}{4}$ in. steel strip, and drilled as shown; the pawls can be filed up from odd scraps of 3/32 in. steel, and should be case-hardened. Both are drilled No. 41; the moving pawl is pivoted to the lever by a 3/32-in. or 7-B.A. screw, and the stationary one works on a stud, same size, going through a hole in the tank, and secured by a nut. A little tension-spring, similar to that on the reversing-lever, keeps the moving pawl in contact with the ratchet-wheel; and a swan-necked spring, made either of 20-gauge steel wire, or a bit of flat spring-steel as used for gramophone governors, does ditto for the stationary pawl. I purloined this idea from my old "Thunderer" alarm clock, purchased for half-a-guinea when I first went to work on the railway; I still have it, and it still does the job after over half a century's practically non-stop run, at a cost of four new mainsprings, all of which I fitted myself. The ratchets of both main and alarm springs are exactly the same as shown, with steel wire "click-springs." A test of "time" in more senses than one! Some of my own lubricators have similar springs, and they all give complete satisfaction. File a nick in the pawl to receive the free end of the spring, as shown.

To assemble, place the stand in the tank, and screw the clack-box into it through the hole in the tank bottom, just finger-tight. Poke the bearing through the hole in tank side, put on the lock-nut, then screw the bearing into the top of the stand. Tighten lock-nut and clack-box. Take off the crank, and insert the crankpin through the hole in ram; hold crank in line with the hole through bearing, insert spindle, and screw home. Put on the ratchet-lever, adjust pawl springs, and you've got it. Next item, erection of lubricators on both engines.

Model Engineers' Supplies

FROM A. J. REEVES & CO. of Birmingham, we have received a copy of a catalogue which lists a wide range of items useful to model engineers and especially to builders of small locomotives. Taps, dies twist-drills, bevel-wheels, spur-gears, gauge-glass, rubber tube, graphited yarn, asbestos sheet, stainless steel balls, brazing materials, solders and a useful selection of sheet metals are a few of the items included.

Castings, parts and sets of blueprints for several locomotives by "L.B.S.C." are listed and priced separately, and there is a large selection of wheel castings available from "O"-gauge to 5-in. gauge. We have inspected several samples of wheel castings and we find them to be of good, grey, close-grained cast-iron, clean and sharp. Small bolts, nuts, washers, and rivets, as well as useful steel and brass rods and angles are also available; and we notice that several of the screws, nuts, and bolts have "M.E." threads.

The price of the catalogue is 6d., and we can commend it to the attention of readers, whether or not they are locomotive builders; for, in addition to the above, die-castings and certain details for some of Mr. Westbury's well-known petrol engines are stocked, as well as a complete range of Percival Marshall & Co.'s publications.

An Experimental Cylinder-Head

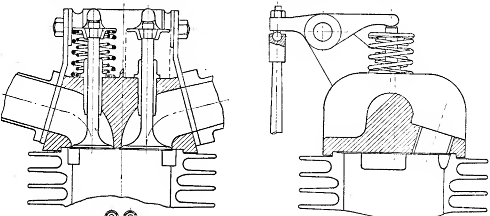
by J. Latta

THE head described in these notes was designed and built to replace the smashed-up head of a single-cylinder of 30 c.c. capacity, built about 15 years ago.

The original engine gave a surprisingly good performance, and I had a lot of fun brake-testing it and making various small modifications before it finally succumbed, due to a broken exhaust valve.

The wreckage lay in a box for a number of years, until one day I was seized with the desire to reconstruct it. A careful examination showed that the crankshaft and crankcase were sound, but that everything above this "had had it," as the Army used to say. It seemed to me to be a good opportunity to try out some theories I had been turning over in my mind regarding the design of a high-performance head; and so the drawing board was got out, and a start made on a preliminary layout to fit on to the old crankcase.

In my case most of the charm of model engineering lies in being able to try out one's own ideas in metal, rather than in copying a ready-made design, and I am always surprised when I hear from fellow enthusiasts that they feel debarred from original work owing to inability to put their ideas on paper in the form of a working drawing. After all, skill at the drawing board, like skill at the lathe or the bench, comes with practice backed by enthusiasm, and the latter quality is seldom lacking in a model engineer.



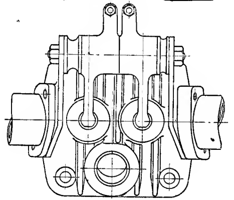


Fig. 1. Details of the air-cooled cylinder-head, designed 1932

The draughtsman's tools are comparatively cheap, and one's preliminary attempts at design can be made with little more in the way of equipment than is available to the average schoolboy. I deplore the misplaced energy of those who proclaim the fact that their models are built entirely by eye, without the aid of a single sketch — generally claiming some sixth sense denied to ordinary folk.

It is an old saying in engineering that it is cheaper to make your mistakes on paper, and the same is of course true of model engineering. It is quicker and better to make even a few

rough sketches before beginning the actual work, than to plunge straight into construction aided only by eye and instinct. Even if the final result is achieved without having to scrap anything, it is seldom that it can truthfully be said that an improvement could not be made at a second attempt. The first attempt is best made on paper.

However, to return to our cylinder-head. The original air-cooled one is shown in Fig. 1, and it will be seen that it was of straightforward design with vertical valves and slightly upswept

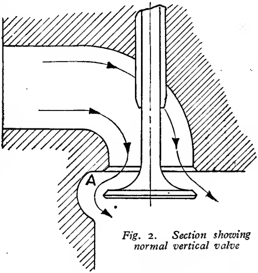


Fig. 2. Section showing normal vertical valve

ports, the diameter of the inlet valve being about 20 per cent. greater than the exhaust, which conforms with normal practice where a high power output is required. The port areas are somewhat greater than normal, the theory being that the losses due to skin friction and eddies would be greater in a small engine than in a large one, and therefore there was justification for making the ports larger in proportion for the small job.

Whether this is correct or not I am not prepared to say, but at any rate I had no cause to be dissatisfied with the power developed; brake mean effective pressures of 115-125 lb./sq. in. being obtained with compression ratios between 8 and 10/1, and this without anything freakish in the way of valve timing.

The main trouble was the heat developed at high speeds, which made bench testing very difficult without arrangements for a really powerful air blast; and it was in fact the failure of the cooling air supply which caused the breakage of the exhaust valve and the smash-up of the original engine.

As the engine was designed for use in a hydroplane where unlimited supplies of cold water are available, I long ago decided that the motor cycle method of cooling for an engine of this type was an unnecessary handicap, and water-cooling was decided upon for the new design.

All overhead valve engines designed for maximum power output employ a domed head and inclined valves, the general theory being that this allows of a more compact form of combustion chamber with space for large valves. An easy sweep of the ports without any sharp bends is also easier to arrange. With moderate compression ratios in which a flattish top to the piston can be used, there is much to be said for this, but if ratios of 10/1 or over are used, the actual shape of the combustion chamber becomes more like half a coconut shell, which is far from an ideal shape, and furthermore, recesses have generally to be made in the piston crown to clear the valves if there is much overlap.

In my own view, for what it is worth, the success of this type of head is mainly due to the easy passage given to the gases by the well-shaped ports, aided in the air-cooled versions by the better cooling possible by adequate finning in the vital area where the two ports adjoin.

If it were possible to arrange for an equally free entry and exit for the gases with a vertical-valve design, the more compact combustion chamber should result in a better power output.

If one studies the matter a little more, and examines existing designs of valve ports with a critical eye, it would seem that they are usually designed as if the valve had no head on it at all.

Consider Fig. 2 for instance, which shows a conventional valve and port. The passage here is so shaped as to guide the gas, just before its entry into the cylinder, in a direction parallel to the valve stem, so that it strikes the head fair and square at right angles. This defect in poppet-valve design is usually regarded as

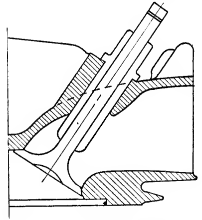
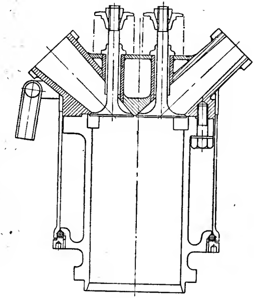


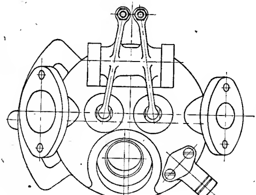
Fig. 3. Valve and port of racing motor cycle

unavoidable unless the valve is given an impossibly high lift. Nevertheless I have seen sketches showing the suggested flow lines for the gases, somewhat similar to the lines shown in Fig. 2; but a moment's consideration of the average speed of the gases should convince one that nothing like this could happen even at cranking speeds, and that the gas must normally pass the head of the inlet valve in a series of violent and confused eddies, due to rebounding from the underside of the valve head.

The clearance between the edge of the valve and the wall of the combustion chamber at *A* in Fig. 2, must be virtually useless, as it would seem very unlikely that the gas could be persuaded to change direction quickly enough to pass any appreciable quantity past the valve head at that point.

Fig. 3 shows the porting of a well-known





racing motor-cycle engine, with inclined valves, and it will be seen that in this case the incoming mixture meets the valve head at an angle instead of square on, and therefore suffers less change of direction when passing into the cylinder than is the case in Fig. 2.

These differences are probably more marked in practice, because in all cases the valve is shown fully open, a position which is only reached during a very short part of the cycle, and, even with the fiercest cams it is possible to employ, the average opening is only about half this.

With these considerations in mind, the new head was designed with straight ports, as in Fig. 4. The aim here is to direct the gas as far as possible across the head of the valve, so that there is the minimum change of direction. It

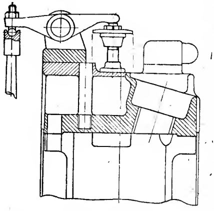


Fig. 4. *Details of water-cooled cylinder-head, designed* 1941

is assumed that no gas will pass the edge of the valve adjacent to the cylinder wall, and therefore the minimum of clearance is allowed here, and advantage of this is taken to keep the recess in the cylinder wall as shallow as possible.

It might be thought that straight ports of this type could be completely finished by machining, but a little consideration will show that this is not the case, as the port would be in the shape of an ellipse at the valve seat. Actually with a tapered port it is an oval, and, therefore, some fairing up must be done to blend in; but as it is possible to get a rat-tail file right through the port this is not a very difficult matter.

At this stage, perhaps I had better enumerate the various other points where I thought that the old design required improvement.

The straight ports were, of course, a completely new feature, but apart from this, experience had shown that other improvements were necessary.

The overheating has already been referred to, and in the main this was dealt with by the change to water-cooling; but I had the feeling that something more was required to ensure that the plug and exhaust valve were kept as cool as possible. To this end, the cooling water was arranged to enter the head in two jets directed on to these vital areas; the cylinder barrel, on the other hand, can easily be over-cooled with detriment to the mechanical efficiency and, therefore, a positive circulation was deliberately avoided in the cylinder jacket, which relies on thermo-syphon from the head through a series of holes just outside the head joint.

(*To be continued*)

PETROL ENGINE TOPICS

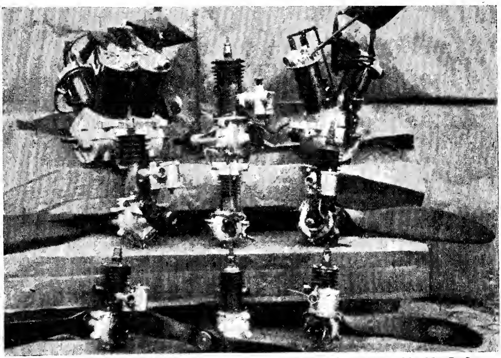
"Support Home Industry!"

by Edgar T. Westbury

IT has been said that nothing can succeed nowadays without a slogan, and no doubt many advertisers, politicians and propagandists have made good capital out of the happy, inspiring or euphonious catch-phrase. Personally, I am of the opinion that this is often overdone, and at the present time, our national diet consists of little else but slogans; but perhaps I am in danger here of straying into perilous topics which are irrelevant for our present purpose. If, indeed, it be true that model engineers need spurs of this nature to rouse them to action, I am, as always, willing to oblige to the best of my ability.

The slogan I have chosen for the heading of this article is by no means a new one. It was used many years ago, in the days when it was thought desirable to exhort the public to buy British goods instead of prohibiting it as we do in our *brave new world*. In applying this slogan to model engineering, the term "industry" should be interpreted in its literal sense, and in particular, with reference to that class of industry which, like charity, begins literally "at home." In other words, it calls for more active encouragement of home craftsmanship in all the competitive pursuits which are organised under the aegis of model engineering.

Many readers will say that it should be quite unnecessary to issue an exhortation of this nature, and I entirely agree with them, but the fact remains that many who are, at least nominally, in the ranks of our fraternity, seem to forget that the primary object of model engineering is a creative one, and that it demands something more of its devotees than the mere acquisition, assembly or competitive employment of models.



A group of model petrol engines, dating from nearly 50 years back, constructed by Mr. D. Stanger

Let it be quite clearly understood that I am not representing model engineering as a "closed shop"; on the other hand, I would throw its gates wide open to anyone who has an interest in models, whatever form their activity, if any, may take. Neither would I deny their right to call themselves model engineers, even though they may not actually make models; but what I do assert most emphatically is that the interests of the model engineering craftsman should come first in any form of competitive model activity, and that the allurements of speed, thrill or spectacle should not be allowed to eclipse the

things that really matter, that is, the construction. design and experimental development of models,

My recent article on "Why Build Your Own Engine?" brought forth a good deal of comment from readers, though I am sorry to say that some of the most interesting communications were only verbal, or were expressly marked "not for publication." In nearly all cases, the really enthusiastic constructors of models thoroughly endorsed my opinions as to the joys and ultimate satisfaction of building models of all kinds, but pointed out that some of the modern tendencies in model activity seem to involve a danger of diverting attention from the creative to the purely competitive side, and even of putting the constructor at a disadvantage.

Unfortunately, this is all too true, and I have been watching this development for some time with great concern, but have hitherto regarded it as a temporary condition encountered in the adjustment of model engineering to modern developments. There is, however, now some reason to believe that it is more than a passing phase, and that it may possibly do considerable harm by discouraging many model engineers, and particularly newcomers to this pursuit, from embarking on the more difficult and serious, but also more satisfying, undertakings in creative and experimental model work.

In this country, the past activities in all branches of model engineering have developed naturally and healthily out of the enthusiasm of the craftsman, rather than having been forced or boosted by any influence from the "stunt" or competitive angle. To take a typical instance, model power boats had been built by amateurs for many years before anyone thought of organising competitions for them, and when this was eventually done, it was generally taken for granted that the boats were entered in competitions by the people who actually constructed them. While there were occasional instances of boat hulls or engines being professionally made, there was no reason to believe that such models enjoyed any special advantages, and their influence on the progress of either model development or sport could be disregarded. I am glad to say that this generally holds true, even up to the present day, in this particular branch of model engineering.

Model aircraft, in its early days, developed in much the same way, but its devotees have never been really keen engine constructors, and with the advent of commercially-produced engines, they promptly abandoned all attempts in that direction. At the present day, I doubt very much whether there is one in a thousand model aircraft constructors who build their own engines and, speaking as a pioneer in the development of model aircraft engines, this has always been a bitter disappointment to me.

The model racing car, in the form which is most popular at the present day, probably owed its existence in the first place to the availability of the commercially made miniature petrol engine, as it was developed primarily in America, where the mass production of miniature engines has been in full swing for very many years. The risk that developments along these lines might possibly detract attention from the home construction of engines, in which I was primarily interested, made me somewhat cautious in discussing this new and exciting form of model sport, which explains why I did not rush into eulogies about it quite as enthusiastically as some people thought I should. But the first serious developments in model racing cars in this country were carried out by men after my own heart, true enthusiasts in the design and construction of engines, so I had great hopes that the recruits, who rapidly flocked to join the ranks of model car constructors, would follow their excellent example. But while I am glad to say that there is a solid nucleus of real craftsmen who build and, in some cases, design all the essential parts of their cars, including engines, the majority nowadays, in their rush to obtain quick results, or perhaps only taking the line of least resistance, succumb to the blandishments of the ready-made engine, and often use as many other ready-made parts as possible. I was informed that at a recent meeting of a well-known model car club, only two cars out of some 50 or so entered in the competitions, had engines built by the car owners themselves.

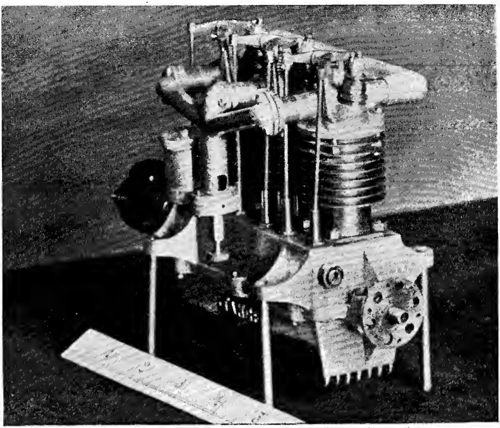
This is not intended as a tirade against commercially-produced engines or their users. As I said in the article previously referred to, I recognise that such engines fill a very useful place, and give facilities to many who would otherwise be excluded from model pursuits, but I feel that, in the best interests of everyone, including the engine manufacturers, it is most essential that the amateur who constructs his own engine should be given special recognition. There are many ways in which this could be done, such as by organising special competitions for models built entirely by the competitor, awarding them extra points in ordinary competitions, or segregation of competitive models into different classes.

I am aware that this puts still more work and responsibility on the shoulders of the already overworked officials who organise and conduct competitions. My suggestions in this direction have often been received coldly for this reason, but I am unable to accept the view that they are impracticable. An even less tenable suggestion made recently by a critic is that it "would not be sporting" of the constructor competitors to ask for special privileges (as a matter of fact they haven't ever asked for them so far as I know—but I most emphatically do!)

Now, the one thing the British have never been accused of, even by their worst enemies, is bad sportsmanship, and this applies in model engineering just as in any other field of sport. The desire of any competitor in any British contest it to see the best man win, but in the issue between a constructor who has spent months of persevering effort in producing an engine, and the owner of an expensive commercially-made and professionally-tuned engine, one may be excused from expressing some doubt as to whether the best man is likely to win. Not that the engine constructor will complain at being outclassed in an unequal contest, but the prospective competitor, whether in the field of model boats, aircraft or racing cars, in weighing up his chances of success, may well feel that it is not

worth his while to take all the trouble of building an engine, when it is so easy to buy one which will do just as well or even better. In making such a decision, he will but grasp the shadow and lose the substance, but it is little use preaching him a sermon on the matter, and the likelihood is that another potential craftsman will be lost to model engineering.

regard to what its eventual performance will be, than to gain all the records on earth and lose the lasting satisfaction which comes only from achieving something entirely off one's own bat. It may here be mentioned that the competitor who chases easy achievement may find, after a long time, that he has merely been chasing a will o' the wisp. Even with the best engines



A model three-cylinder four-stroke aircraft engine, constructed by Mr. Stanger in recent years

I challenge anyone to deny that the man who builds his own engine and puts up a modest performance with it, is a better model engineer than one who breaks all existing records with an engine someone else has built, and that he is entitled to very special consideration on that account.

No doubt I shall receive many criticisms on this point, some of them beginning with the all too familiar phrase—" If we are out purely for speed and nothing else . . . " Well, dear reader, if that is all that *you* are out for, I advise you not to waste time in reading my articles, for you and I have nothing in common. To me, speed in any type of model is worth while only if it comes as the culmination of patient and worthy effort ; of itself, it has little meaning and even less practical use. Far better to concentrate on a really good job of model engineering, without

and other accessories that the manufacturer can provide, there is only room for a few people at the top of the tree ; the others can only be " also rans."

I have seen many people using very highly tuned commercially-made engines, who have obviously not the least idea of using them to anything like their full advantage, and what is more, some of them are never likely to learn, whereas the man who builds an engine simply cannot help but learn a good deal in the process of building and handling it.

Even the humblest engine constructor, though he may be left behind in a race, can be justifiably proud of the fact that the performance of his model is due solely to his own efforts. Like the Village Blacksmith, he can enjoy the satisfaction of " something attempted, something done."

(*Continued on page* 199)

Home-Made Door-Bell Chimes

by Trevor Holloway

THE majority of readers will doubtless agree that the strident note of an ordinary door bell is far from pleasant. It can be extremely irritating at times when callers are numerous. Why not replace your existing bell with a set of chimes? They are equally effective and would make a pleasing feature for any home.

By referring to Fig. 1 you will appreciate that it is possible to arrange for two, three or more notes in your chimes, merely by adding necessary contacts, tubes and bell units. With a little ingenuity the first "quarter" of Westminster chimes could be reproduced, or any other similar sequence of notes.

Here, briefly, is the manner in which the apparatus operates. When the bell-push on the door post is depressed, it actuates a solenoid magnet which in turn propels a small brass or other metal ball (such as a ball-bearing) along the sloping trough X. At the same time an auxiliary arm attached to the solenoid magnet pushes a second ball along the smaller trough marked Y. The angle of incline at which each of the two troughs is set must be such that the ball in Y trough will not return and close its circuit until such times as X ball has reached its maximum upward travel limit.

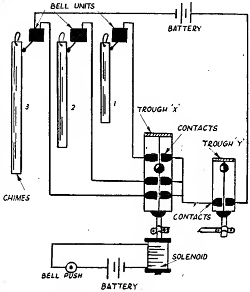


Fig. 1. Circuit and layout of door-bell chimes

A study of the circuit diagram will show you that in this way the bell contacts in trough X are "dead" while X ball is on its upward journey, but "live" by the time the ball begins its return, because Y ball by now is back in place and completing its circuit.

You will probably ask: "Why bother with Y circuit at all?" The answer is, of course, that without it you would have X ball ringing the chimes in ridiculously rapid succession on its *upward* journey instead of in more leisurely fashion as the ball rolled slowly back on its return journey.

It is only by experiment that the angle of incline at which the two troughs are set can be determined. The size and weight of the metal balls and the power in the "kick" of the solenoid magnet are factors largely governing the matter.

Suggested dimensions for the two troughs are: Length of X trough, 12 in.; Length of Y trough, 6 in. Once the degree of angle has been satisfactorily arrived at, the troughs should be mounted on a small wooden bracket so that they can be fixed to the wall in close proximity to the tubular chimes.

The circuit diagram, as seen in Fig. 1, should make details of wiring clear. The bell contacts fitted to the sloping sides of trough X are of brass, and a hole should be punched in each contact strip for wiring up.

Details for making a suitable solenoid magnet may be seen in Fig. 2, although it is often possible to purchase one quite reasonably from dealers in second-hand electrical accessories. The coil should be wound with about 15 layers of No. 16 single copper-covered or enamelled wire. A brass rod is threaded or pinned to the end of a 2½-in. soft-iron plunger (A) as shown. The upper end of the brass rod passes through a hole drilled in the centre of the 1-in. iron sleeve (B). A light brass or bronze spring keeps the plunger pushed outward ordinarily. When the push-button (the bell-push) is depressed, current flows through the coil, and the iron plunger (A) is drawn into the direction of the soft-iron core (B), which is fitted tightly into the brass tube.

A brass cross-piece (C) is fitted to the main plunger and supports the auxiliary plunger which operates the ball in Y trough.

The bell units, seen in Fig. 1, are of the usual household type. Normally, of course, the striking arm of the bell unit would vibrate several times, but by bending the spring on the armature so that it does not break contact with the screw in the usual way, it can be made to give a single stroke only. More resonant and pleasing tones can be obtained if the metal bell clappers are removed and wooden ones substituted.

The actual chiming units could be hardwood or metal tubes, or merely metal rods. It is suggested that a visit to a scrap-metal dealer's yard is the best way of obtaining metal tubing. Very often such dealers have copper boiler tubing, which is ideal for the purpose. When cutting

the tubes or rods to make them produce the required note, it is advisable to tune them by means of a piano. Decide which key is most convenient (*A flat* is a very pleasing key), but do not cut the tubes or rods until you have done

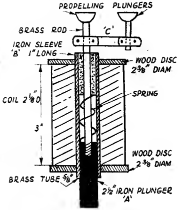


Fig. 2. Details of solenoid magnet

a little experimenting. If you have two rods or tubes of known length, by means of the piano find which note they produce. Next, measure the length of each tube or rod and determine how many semitones are represented by the difference

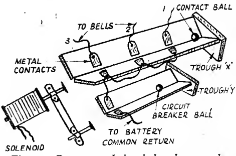


Fig. 3. Contact and circuit-breaker troughs

in length. Thus you will have the necessary data for cutting the chime units so that they will produce the required notes of the chime as a whole. It is not possible to give fuller details on tuning, as the widely differing types of metal tubing and rods all have their peculiarities of resonance in relation to their thickness, diameter and the nature of the metal itself.

In conclusion, there is one point which should be noted in Fig. 3. The pairs of metal contacts must not make contact in the well of the trough. There must be a slight gap between their lower extremities, yet at the same time be not too widely set that the travelling metal ball fails to act as a connecting link as it passes over them.

Petrol Engine Topics

(*Continued from page* 197)

A Model Petrol Engine Pioneer

A few days ago I received a letter from Mr. D. Stanger, who may be remembered by some of the older readers of THE MODEL ENGINEER as a noteworthy pioneer in the construction of model petrol engines and aircraft. Mr. Stanger built some very successful engines in the very early days of this century, including a vee-twin engine and a vee 4-cylinder engine, which were used in experiments with model aircraft propulsion as early as 1908. The record set up by Mr. Stanger in 1914, by maintaining a petrol engine-driven model aircraft in flight for a duration of 51 seconds, was held against all comers until Captain Bowden, in collaboration with myself, improved on this performance in 1932.

Mr. Stanger is now living in retirement in Somerset, and still retains a keen interest in models at the age of 77, though his activity in their actual construction has been hindered by failing eyesight. In addition to petrol engines, he has built many other types of models, including locomotives.

In the group of engines shown in the first photograph, the vee 4 and vee-twin engines are seen in the top row, and in my opinion, these two engines, at least, rank as historic examples of really advanced design, in view of the early period of their construction. The other models in this photograph are apparently all 2-strokes, with the exception of the one in the centre, which is a single-cylinder overhead valve 4-stroke.

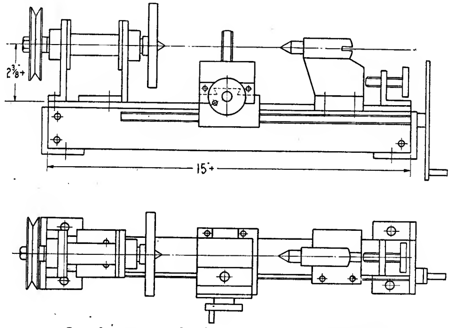
The second photograph shows a 3-cylinder 4-stroke engine which has been constructed by Mr. Stanger within comparatively recent years. particulars are not available regarding its capacity or performance, but personally I have little doubt that this is as successful as the others in Mr. Stanger's collection. Some years ago I illustrated a 3-cylinder in-line 2-stroke of approximately 15-c.c. by Mr. Stanger, and a patented vee-twin motor cycle 2-stroke engine of his design was once in production.

The modern enthusiast who has no use for anything except super performance and incredible r.p.m. is often inclined to be very scornful of the relatively cumbersome and inefficient efforts of the pioneers, but for my part I never cease to marvel at the energy and initiative which was devoted to the construction of these early models. None of the facilities enjoyed by the modern user of small petrol engines were then available ; there were no ready-made ignition coils or sparking-plugs, nor were the constructors of engines able to call upon any established designs or fund of exact data. The early volumes of THE MODEL ENGINEER contained many records of uphill struggles by determined engine constructors, which may well serve as an example to be copied by the model engineers of the present generation.

A HOME-MADE LATHE

by F. T. Leightwood

THIS is a simple centre lathe made from odds and ends of steel, a bicycle hub (cost 3s. 6d. approx.), a ¼-in. drill-chuck (cost 7s. 6d.) if desired, and if possible a No. 1 Morse tapered socket. The tools used were files, scrapers, drills and taps, small chisel, a square surface block and surface plate and a blowlamp or other welding and brazing equipment.



General arrangement, elevation and plan, of an home-made lathe

The Bed

Construction is commenced by levelling and truing the top face to a surface plate. This is one of the most important parts and requires a lot of care.

Next, the sides are filed and scraped to an angle of 60 deg. (approx.) to the top face and kept as near as possible parallel. To save possible damage to the finished faces the foot-angles can be fitted.

The Saddle

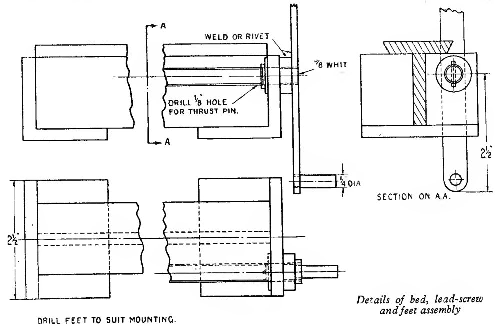
The first part to be made is the baseplate, this is a piece of ⅜-in. plate levelled on both sides and the front and left-hand edges squared.

The front taper strip is a piece of 1-in. × 1-in. angle, bedded on the top face to the underside of the baseplate, and the edges to the front edge of the bed.

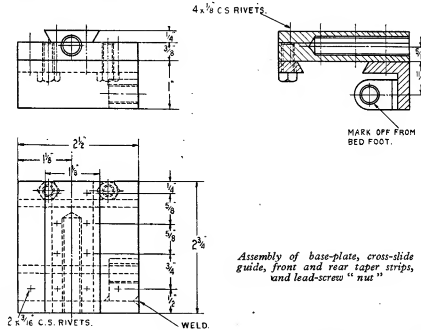
When these two parts are riveted together, the rear taper strip (¼-in. plate) is fitted the same way using set-screws instead of rivets to allow for adjustment, and is bedded in the same way. At this point the bed can be checked for any high spots, scraping them down until the saddle slides freely and without shake. The top plate is levelled. and the edges squared, especially the front and left-hand edges, and the left-hand taper strip bedded to it and a 60 deg. angle filed and scraped. These two are riveted together with the left-hand edges in line. Next, the cross-slide guide is levelled on both sides and the edges squared, and the left-hand edge bedded to the left-hand taper strip. The right-hand edge is filed to the angle and the right-hand taper strip is bedded to it. To ensure the correct position of the latter, it is best to clamp in position with the guide also in position for drilling. When these two strips have been fixed and the guides move freely, a clearance is filed on the underside of the strips, leaving the guide a little thicker.

The guide is now rivcted in position on the baseplate. Here extreme care must be exercised, as the position of this is one of the main factors for keeping the cross-slide square to the axis of the late.

The front plate is drilled and bolted to the top plate, and the tapping hole can be marked off and drilled through the ⅜-in. hole. This hole can also be used to guide the tap, as most ⅜-in. taps have a ⅜-in. plain shank. The cross-feed



Details of bed, lead-screw and feet assembly



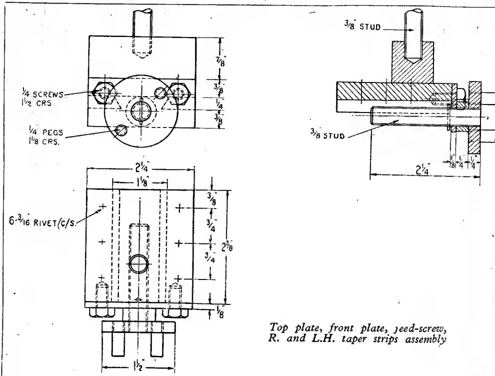
Assembly of base-plate, cross-slide guide, front and rear taper strips, and lead-screw " nut "

screw, a long $\frac{3}{8}$-in. B.S.F. stud, has the hand wheel spaced with washers to clear the $\frac{1}{4}$-in. set-screws holding the front plate to the top plate, and a $\frac{1}{8}$-in. pin tapped into the screw acts as a keeper for withdrawing the tool.

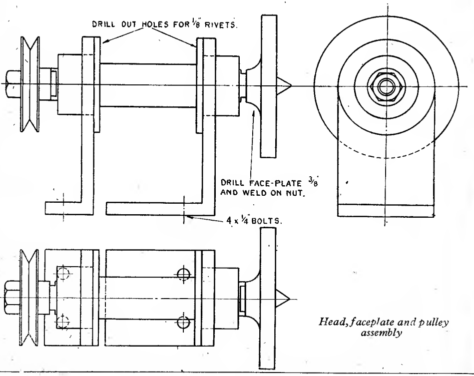
The lead-screw can be fitted in a similar manner, fitting the washer behind the retaining-pin, as this takes the drive when traversing right to left, finally, the toolpost could be mounted on the top plate.

The Head

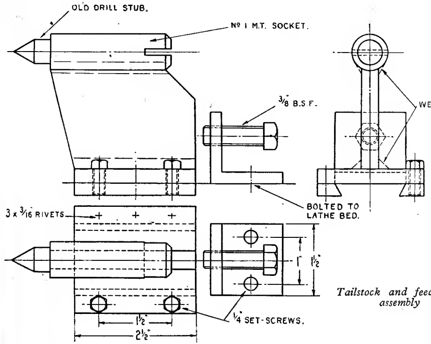
This consists primarily of a bicycle hub, either front or rear, provided the spindle is $\frac{3}{8}$ in. dia. (*not* $\frac{5}{16}$ in.). Mark off the position and diameter of the ends of the hub on the angles supporting



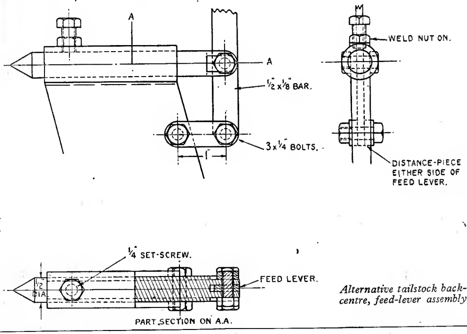
Top plate, front plate, feed-screw, R. and L.H. taper strips assembly



Head, faceplate and pulley assembly



Tailstock and feed-screw assembly



Alternative tailstock back-centre, feed-lever assembly

it and either drill out or chisel out after drilling a ring of small holes inside the circle. Fit one angle to the hub and mark off the spoke holes, drill out ⅛ in. and rivet in position, repeating the process with the other angle and keeping the feet as level as possible.

When bedding the underfaces of the head, keep the spindle in position to check that it is parallel. Next, mark off and drill the four ¼-in. holes for the holding-down bolts and clamping the head in position on the bed, set up on the surface plate with the top face of the bed square

and the spindle level with the plate, and mark off the bed for drilling. To make a faceplate, any suitable nut can be welded or brazed to a circular piece of steel by drilling a ⅜-in. hole in the centre and clamping the nut with the spindle and another nut behind the plate. The plate can be fitted and trued up when the lathe is mounted and the drive coupled up. Any available pulley can be used, the original being part of a blackout arrangement with its bore opened out to ⅜ in.

The Tailstock

For this, any Morse taper socket can be used, a straight-sided type being the best. This is welded to a web which in turn is welded to a foot. Care must be taken when bedding the foot, as it must be finished the same height as the head, as well as having its centre-line parallel to the bed. When the foot has been trued satisfactorily the rear taper-strip is fitted, its position being set by clamping the strip to the tailstock and mounting in position on the bed.

Fit any good long drill and check with a pointer mounted on the saddle, and also that the centre of the drill points into the centre of the faceplate, drilling and riveting when correctly adjusted. The front taper-strip is fitted in the same manner as the rear taper-strip on the saddle.

As the centre is fixed in the tailstock, the whole assembly must be moved along the bed for drilling, etc., therefore, an angle bracket must be mounted on the extreme end of the bed for the feed screw, which acts on the rear edge of the web.

The Alternative Tailstock

Instead of the socket, a piece of ¾-in. bar is welded on top of the web and a ½-in. hole is drilled parallel to the foot, the same height as the front centre, and the back centre can be made from a piece of ½-in. bar.

A feed lever is hinged to the near edge of the web and the rear portion of the back centre, which is slotted for this purpose. As the feed screw is not required with this tailstock, a locking screw is fitted to the foot and another on the top to lock the centre in position.

Additional Equipment

Self-centering chuck. A ¼-in. drill-chuck, with a taper hole in the back for mounting, can be mounted on a separate spindle by filing a taper to suit the chuck, and tapping the chuck hard on to the taper, taking care not to bend the spindle in the process.

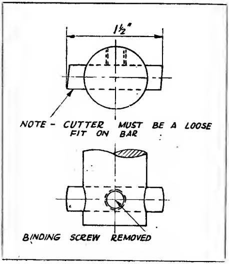
Four-jaw chuck. A steel ring with a cross-section of at least ½ in. sq., can be mounted on a plate similarly made to the faceplate, with four tapping holes of any convenient size drilled radially and set-screws inserted.

A Floating Cutter

by R. Johnston

TO obtain a dead parallel bore such as would be required for a steam-chest, the following tool will be found invaluable. For instance, if, say, a 1½-in. A limit hole is required, bore out and tool in the usual way, taking care to leave about 0.010 in. under size. Now grind a piece of ⅜-in. section steel, rounded as in illustration to the size you wish the bore to be.

Note that this has a double-cutting action, but the whole secret with this tool is that it is not bound down with a screw when cutting. In point of fact, it must be a very loose fit in the boring bar. Remember its purpose is only to remove approximately 0.005 in. each side when in use in the boring bar. The latter is brought to centre of hole, cutter inserted and fed very slowly and at a very low turning speed through the job.



The result is a perfect, dead parallel and precision-size bore, requiring little, if any, final lapping for piston.

It should be noted that, before using the tool, it should be finally brought down to the size required with the hone or oil-stone. A whole range of these floating cutters can be made up, using whichever section of steel you may fancy, provided you have a bar or bars to suit.

On an old lathe, the method of finish-boring is invaluable, giving dead true accuracy, and, indeed, is well-nigh indispensable. It is excellent on brass and cast-iron, and a mirror-like surface is quite easily obtained in this way.

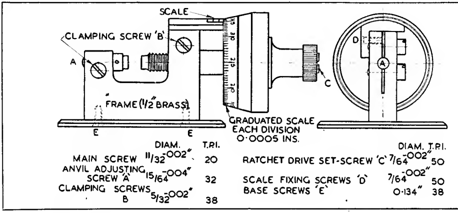
ANOTHER OLD MICROMETER

by J. A. Williams

I WAS very interested in the article "An Interesting Old Micrometer," by H. E. White, published some time ago in THE MODEL ENGINEER, as I have an instrument the same as his, but with slight differences, which are listed below :—

tools. Yet he has obviously concentrated on the 20 t.p.i. and its accuracy working in the female screw—the *sine qua non* of a good micrometer. In my example the screw is worn—all adjustment by clamping screw *B* is taken up.

I should be very pleased to hear from Mr.



Component	Mr. White's	Mine
Base	Thick, round, fastened to body by three screws.	Square, $\frac{1}{8}$ in. thick, chamfered, fastened by two screws.
Measuring screw	Hard $\frac{5}{16}$ in. dia. Both	Soft 11/32 in. dia.—0.002 in. 20 t.p.i.
Female screw hole for above	1 in. long	$1\frac{1}{16}$ in. long.
Graduated collar	Double ring of graduations	Plain graduations.
Anvil	Hard, straight shoulder	Soft, radiused reduced.
Circular index collar.	$1\frac{7}{8}$ in. dia.	$1\frac{13}{16}$ in. dia.

I made a list of dimensions of the screws on mine—shown on the bottom of the drawing—in the hope I should find out something—except, of course, the recurring —0.002 in. in each diameter. On examination the screw form is nearer B.A. than Whitworth—except in the measuring screw. I am quite sure the same craftsman made our two instruments, as the variations might easily occur due to lack of proper materials and precision

White the name of the 19th century craftsman on the base. Is he certain he is the maker ? Mine has "C. Room" scratched on the base at the anvil end and this is repeated lengthways in full ; "Room" is distinguishable. What "C" stands for is given in full, but is nearly obliterated and would need an expert to decipher it. I feel that any information one can get does tell us something of the marvellous craftsmen that produced these instruments. In an article in *The English Mechanic* for 1865, on the lathe and its fittings, the writer mentions micrometers and says they were capable of measuring to hundredths and some to thousandths of an inch ! Actually Julius Horstmann, of Bath, made his micrometer during this year capable of measuring to ten thousandths (it is now in the Science Museum), and Whitworth's measuring engine is about this date, too. Micrometers were known even earlier than this—an interesting example and the earliest in my collection—was the subject of an article in THE MODEL ENGINEER some years ago. The micrometer under discussion is the only one of late 19th century [?] I have—the majority being early 20th century ones. I got it off a barrow in Farringdon Road Market for five shillings, in 1939. Knowledgeable friends who have seen it suggest 1880 as a possible date, and its use either in clock or watch making in Clerkenwell or—a better guess—in the manufacture of small parts for the better class of sporting-guns, for which London is famous—so they could be sent out and fitted without trouble to the gun or need to return it to the makers.

Editor's Correspondence

Gear-cutting Data

DEAR SIR,—With reference to Mr. D. Bamping's query in the July 1st issue of "our" journal. The particulars he requires are 39 teeth of 16 d.p., the gear being ⅝ in. thickness, and has a 1⅜ in. hole through, there being no boss or facing either side of the gear, and is fixed in position on the cone pulley by two ¼ in. Whitworth keys fitted opposite to each other, half in gearwheel and half in cone pulley boss. Also fitting on this boss or sleeve, is the spider in which the locking-stud is located for single-gear drive. Mr. Bamping should be careful when removing the mandrel, to remove the locking-screw (or pinch grub-screw) from the feed gear to the tumbler reverse cluster (situated at the tail end of the mandrel inside the headstock tail bearing-housing or gear-guard).

If Mr. Bamping desires any further information and will write to me c/o The Editor, I shall be pleased to supply him to the best of my ability. There are some points in which Mr. Bamping could no doubt assist me, as my lathe started its career under my ownership minus all of the undergearing, and spares and information were non-existent. However, being a glutton for punishment, I just pressed on regardless, and I hope some day to publish the results in THE MODEL ENGINEER, when I have finally completed the modifications to the excellent, but long-suffering pet of mine.

Yours faithfully,
Manchester. J. MEADOWS.

A Slotting Attachment for the Lathe

DEAR SIR,—I have read with considerable interest the article by "Ned" on the above subject, in the July 1st issue of THE MODEL ENGINEER.

I have always considered that the need for an attachment of this description for the amateur's lathe is really great, and it has always been a source of surprise to me that the manufacturers should not put something on these lines on the market. (Or do they? Perhaps I have missed it!)

However, the design of this fitting is largely a matter of personal opinion, and I would suggest that in the one described the wear and tear on the headstock bearings would be very undesirable. These bearings, after all, are intended mainly to take the fairly steady pressure due to a normal cut, and to expect them to withstand the hammering action of a reciprocating cut is, to my mind, asking for trouble on a small lathe.

My own design sacrifices power drive but gains other advantages. It consists of a horizontal hand-lever attached to a casting which is clamped across the lathe bed at any desired position, and a connecting-link to the lathe saddle, which, when the clasp nut is released, is free to move by means of the lever along the bed. The tool is normally fixed to a holder mounted on a Myford vertical slide, which in turn is mounted on a suitable casting clamped to the lathe bed at the headstock end. This, in effect, transforms the lathe into a hand shaper.

As an alternative, the tool can be clamped to the cross slide and the work held either on the vertical slide assembly just mentioned, or in the lathe chuck. With the latter method one can cut keyways, internal or external, in a turned piece before it is removed from the chuck, thus ensuring accuracy.

Another method is to mount the tool in a boring bar between centres. This can be used for cutting keyways in an item which has been bored on the cross slide, and again this can be done immediately after boring without disturbing the clamping.

In addition, the possibilities of mounting the tool eccentrically in the chuck, for cutting arcs, should not be forgotten, although personally I dislike putting much side pressure on my lathe chucks.

It is hoped that these notes will draw other readers' attention to the possibilities of this type of attachment, and although I have criticised this particular design, I would like to congratulate "Ned" on his useful and interesting articles.

Yours faithfully,
A. MANNING.
London, E. A.M.Inst.B.E., A.M.I.E.D.

DEAR SIR,—In reply to the letter by Mr. A. Manning, there is no reason whatever to suppose that the wear and tear on the headstock bearings of the lathe would be any greater when using them to drive the slotting attachment than it is under average conditions of use. If the attachment is used properly and for purposes within its scope, there is no "hammering action" on the bearings, and the circumstances imposed upon them are certainly not greater than those produced when taking an intermittent cut on a fairly heavy casting. The attachment described has been in use for some years now and no ill effects whatever to the bearings have been noticed.

The hand-lever attachment suggested by Mr. Manning is certainly quite practical and has advantages for certain kinds of work. I have used a somewhat similar attachment and agree that it will do all that Mr. Manning claims for it; but there are certain obvious advantages in being able to use the power of the lathe driving-motor for taking cuts instead of having to rely entirely on muscular strength. As a matter of fact, all types of lathe attachments have their uses, and there is practically no end to the diversity of designs for attachments which will solve many workshop problems.

Yours faithfully,
"NED."

Slot-headed Screws

DEAR SIR,—As one who, in season (and possibly out), has hammered away at this particular aspect of model engineering, may I be allowed to comment on the letter from Mr. A. E. Williamson?

Any engineer worth his salt, who is familiar with locomotives, knows that slot-headed screws are used in full-size practice to a not inconsiderable extent; he also knows that they are *not* used for holding on cylinder covers, for fixing cylinder to frames, for fixing frames to buffer-beams, for the retaining caps of outside crankpins and coupling-rod pins, in the joints of articulated coupling-rods and as joint pins in valve-gear. Those are the places for which slot-headed screws should *not* be used on any model claiming to be representative.

In all the criticisms of the use of slot-headed screws on models that I have seen in your columns, the reference has been to their use in the wrong places and for the wrong purposes; so far as I have seen, there has never been any suggestion that they are not used at all on engine work in general or locomotive work in particular.

There is a place for everything and the objection to slot-headed screws is not to them *per se*; but when they rear their horrid heads in the *wrong* places. If Mr. Williamson is able to get to the "M.E." Exhibition I am quite sure that he will be able to feast his eyes on lots and lots of slot-headed screws used where hexagon bolts and nuts, studs, and hexagon nuts, or hexagon-headed set-screws *should* be used.

As to Mr. Williamson's wonder as to whether the judges' knocked-off marks for the use of slot-headed screws in the *right* places in assessing his model locomotive at the 1935 Exhibition, I cannot, offhand, remember who the judges were that year; but, by and large, they have always been gentlemen with a comprehensive knowledge, and it is more likely that Mr. Williamson got *extra* marks for fidelity to detail in this connection.

Yours faithfully,

Harrow. K. N. HARRIS.

Club Announcements

Talbot House Model Engineering and Crafts Club

Our first model engineering and crafts exhibition, which was held during the week June 19th to 28th, was successful, both financially, and in that it aroused quite a good deal of public interest, also gaining for the club several new members.

The first prize and silver cup for marine models—power-driven, was awarded to Mr. J. W. Pattison of T.H.M.E.C.C. for the motor yacht *Elizabeth*—i.c. engine.

The silver cup, which was donated to the club by an anonymous well-wisher, is to ke piesented annually for the best work of the year.

Mr. V. G. Pearson has had to resign from the secretaryship of the club, owing to pressure of other work. The new secretary is now CYRIL JOHNSON, 37, Highfield Drive, South Shields.

The Peterborough and District Model Engineering Society

The above society will be holding its exhibition from August 31st to September 4th at Bishops Road Schools. A really attractive show is anticipated; the railway track will be in use as usual and we hope to have a race car track in operation.

A new feature is a prize of £5 5s. 0d. for the best model entered by anyone other than our own members, as we feel this should encourage a few of the lone hands to come out into the open, at least.

The venue on this occasion is much more spacious and that will enable us to give the exhibits a much better placing, and, we hope, allow our visitors more freedom than before.

Hon. Secretary: JOHN H. HURST, "West-Rays," Lincoln Road, Werrington, Peterborough.

Exeter and District Model Engineers' Society

The above society is holding an exhibition from September 2nd to 11th, 1948, in Messrs. Barton Motor Co. showroom, 28, Sidwell Street, Exeter. The exhibition will be open from 11 a.m. to 9.30 p.m. daily.

A feature of the show will be a large "O" gauge layout. Ships, "live steam" exhibits, trade stands, and models working under compressed air will be displayed.

We are hoping that neighbouring societies will support us and that the loan section will be very strong.

Hon. Secretary: LESLIE J. OLDRIDGE, 38, Broadway, Exeter.

Birmingham Society of Model Engineers

The formal opening of the 3½-in. and 5-in. gauge model locomotive track will take place on Saturday, September 11th, 1948, at 3 p.m., by Duncan Campbell. This will be a private function (owing to catering and other difficulties) and limited to members and families and a few guests. It is regretted that a general invitation cannot be extended to all.

However, all clubs and societies interested are invited to attend on the following day, Sunday, September 12th, for an Inter-Club Gala Day from 10 a.m. to dusk, and members of such clubs are asked to bring their locomotives for a real running test.

The track is at Campbell Green, 87, Horse Shoes Lane, Sheldon, Birmingham, and is continuous—1,020 ft. long, and passenger trucks, water and coal, and other facilities will be available. A car park in the grounds and light refreshments (not on the house) will be provided.

Preference will be given to visiting clubs as regards running, although there will be locomotives of the society at hand.

Will all secretaries please notify the Hon. Secretary of the above society of those who wish to come, well in advance in order that arrangements may be made to feed them. An indication of the routes will be sent to the secretaries.

Any further information can be obtained from the Hon. Secretary, WILF. H. KESTERTON, 31, Wood Green Road, Quinton, Birmingham.

The Model Power Boat Association

The Grand Regatta will be held at the Boating Lake, Victoria Park, Hackney, London, E., on Sunday, August 29th, commencing at 11 a.m.

Events for all types and classes of boats as recognised by the M.P.B.A. will be held, and several trophies will be contested for.

Will all affiliated members make an effort to arrive early, as last year difficulty was experienced in finishing in reasonable time, due to the large number of boats present.

All enquiries concerning this event, or any queries regarding regattas, etc., should be addressed to the Hon. Asst. Sec., A. Rayman, 59, Murrillo Road, Lee, S.E.13, Lee Green 5401.

Hon. Sec.: J. H. BENSON, 70, Broadfield Road, Catford, S.E.6. (Hither Green 1486.)

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Readers desiring to see the Editor personally can only do so by making an appointment in advance.

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